



Physical Science Scope and Sequence

COURSE OVERVIEW & TIMING		
This section is designed to help you see the flow of the units/topics across the entire school year.		
Unit		Unit Length
Unit 1:	Study of Matter	1 st Quarter
Unit 2:	Energy and Waves	2 nd Quarter
Unit 3:	Forces and Motion	3 rd Quarter
Unit 4:	The Universe	4 th Quarter

OVERALL COURSE TIMING	
This section is designed to help you compare the number of available instructional days to the number of days accounted for in the Scope and Sequence.	
	Course Length
Total number of instructional days in school year:	176
Total number of instructional days for all units included in Scope and Sequence:	160

Science Inquiry and Application (SIA)
During the years of 9-12, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas: • Identify questions and concepts that guide scientific investigations. • Design and conduct scientific investigations. • Use technology and mathematics to improve investigations and communications. • Formulate and revise explanations and models using logic and evidence (critical thinking). • Recognize and analyze explanations and models. • Communicate and support a scientific argument.

FIRST QUARTER: Study of Matter <i>Matter was introduced in the elementary grades and the learning progression continued through middle school to include differences in the physical properties of solids, liquids and gases, elements, compounds, mixtures, molecules, kinetic and potential energy and the particulate nature of matter. Content in the chemistry syllabus (e.g., electron configuration, molecular shapes, bond angles) will be developed from concepts in this course.</i>		UNIT 1 LENGTH: Days/Weeks 40	Resources
UNIT 1 STANDARDS			
	Classification of matter HS-PS1-1 Next Generation Standards ☐ Heterogeneous vs. homogeneous ☐ Properties of matter ☐ States of matter and its changes Atoms HS-PS1-1, HS-PS1-3 Next Generation Content Standards Content introduced in middle school, where the atom was introduced as a small, indestructible sphere, is further developed in the physical science. ☐ Models of the atom (components) ☐ Ions (cations and anions) ☐ Isotopes Periodic trends of the elements HS-PS1-1. HS-PS1.2 Next Generation Standards The properties of metals and nonmetals and their positions on the periodic table, is further expanded in this course ☐ Periodic law ☐ Representative groups Bonding and compounds HS-PS1-1 Next Generation Standards The chemical joining of atoms is studied in more detail. Atoms may be bonded together by losing, gaining or sharing electrons to form molecules or three- dimensional lattices. ☐ Bonding (ionic and covalent) ☐ Nomenclature Reactions of matter PS1.B: Next Generation Standards Conservation of matter is expressed by writing balanced chemical equations. Reactants and products can be identified from an equation and simple equations can be written and balanced given either the formulas of the reactants and products or a word description of the reaction. ☐ Chemical reaction ☐ Nuclear reactions		• ODE Model Curriculum • Chapters 1-5 • Unit 1 Curriculum Maps • www.nasa.gov/ • www.discoveryeducation.com/search/-/index.cfm?campaign=flyout_teachers_912_science • science.howstuffworks.com provides short video clips for introducing topics or further research. • www.pbs.org/wgbh/nova/physics/states-of-matter.html • www.nextgenerationsciencestandards.com • Soft Schools SOLE Cleveland www.nbclearn
Spiraling	ELA: W.9-10.1, W.9-10.7, L.9-10.6 W.9-10.1A AND W.9-10.1B,W.9-10.1D MATH: HSN-Q.A.1, HSA-CED.A.4 Expressions & Equations: 8.A.4		
Essential Questions	www.9th grade draft.com		
Differentiated Instruction	• UC Irvine FOCUS! 5 E Lesson Plan Title: Marble Isotope Lab • Exploring chemical bonding SEP LESSONS • Periodic Table: Ferocious Elements - Teaching Channel • https://web.midstatespec.org/Public%20Forms/.../Grades%209.../atoms.p • https://www.teachingchannel.org/videos/periodic-table		
Assessments	• Pro-Core Leader in Focused Diagnostics Standards-Based		
Vocabulary	• *9th grade science vocabulary flashcards Quizlet • www.learnnc.org/lp/pages/2904		

SECOND QUARTER: Energy and Waves <i>Major concepts about energy and waves are further developed. Conceptual knowledge will move from qualitative understandings of energy and waves to ones that are more quantitative using mathematical formulas, manipulations and graphical representations</i>		UNIT 2 LENGTH: Days/Weeks 40	Resources
UNIT 2 STANDARDS			
	Conservation of energy HS-PS3-1, HS-PS3-2 Next Generation Standards Energy content learned in middle school, specifically conservation of energy and the basic differences between kinetic and potential energy, is elaborated on and quantified. - Quantifying kinetic energy - Quantifying gravitational potential energy - Energy is relative Transfer and transformation of energy waves HS-PS3-4, HS-PS4-1 Next Generation Standards - Refraction, reflection, diffraction, absorption, superposition - Radiant energy and the electromagnetic spectrum - Doppler shift Thermal energy HS-PS3-1 Next Generation Standards Processes of heat transfer, including conduction, convection and radiation, are studied. The role of thermal energy during heating, cooling and phase changes is explored conceptually and graphically. Rates of thermal energy transfer and thermal equilibrium are introduced Electricity Circuits are explained by the flow of electrons, and current, voltage and resistance are introduced conceptually to explain what was observed in middle school. The differences between electrical conductors and insulators can be explained by how freely the electrons flow throughout the material due to how firmly electrons are held by the nucleus - Movement of electrons - Current - Electric potential (voltage) - Resistors and transfer of energy		- ODE Model Curriculum - Chapters 13, 14 and 17 - Unit 2 Curriculum Maps - www.nasa.gov/ www.discoveryeducation.com/search/-/index.cfm?campaign=flout_teachers_912_science - Investigate the star life cycle with interactive media or gain an overview of astronomical spectroscopy in studies of stellar spectra. - sunshine.chpc.utah.edu/labs/star_life/starlife_main.html "Energy: Misconceptions and Models" is a downloadable document from the U.K. Department for Education that gives strategies for teaching different models of energy and addressing misconceptions about energy. www.education.gov.uk/schools/toolsandinitiatives/nationalstrategies * Introduction to Electricity - SRP
Spiraling	ELA: W.9-10.1, W.9-10.7, L.9-10.6 MATH: HSN-Q.A.1, HSA-CED.A.4 Expressions & Equations: 8.A.4, <u>HS-PS4-1 Waves and their Applications in Technologies for Information Transfer</u>, <u>HS-PS4-5 Waves and their Applications in Technologies for Information Transfer</u>		
Essential Questions	Essential Questions. Energy. Collections Essential Lens		
Differentiated Instruction	https://www.cde.state.co.us/standardsandinstruction/sc8-transferandtransf		
Assessments	<u>Pro-Core Leader in Focused Diagnostics Standards-Based</u>		
Vocabulary	www.quia.com/jq/1458821list.html		

THIRD QUARTER: Forces and Motion		Resources
Major concepts of motion and forces are further developed. Speed has been dealt with conceptually, mathematically and graphically. Mathematics (including graphing) is used when describing these phenomena, moving from qualitative understanding to one that is more quantitative. For the physical science course, all motion is limited to objects moving in a straight line either horizontally, vertically, up an incline or down an incline, that can be characterized in a single step .Motions of two objects may be compared or addressed simultaneously.		
UNIT 3 LENGTH: Days/Weeks 40		
UNIT 3 STANDARDS		
	Motion HS-PS2 Motion and Stability: Forces and Interactions The relative nature of motion will be addressed conceptually, not mathematically. ☐ Introduction to one-dimensional vectors ☐ Displacement, velocity (constant, average and instantaneous) and acceleration ☐ Interpreting position vs. time and velocity vs. time graphs Dynamics (how forces affect motion) HS-PS2 Motion and Stability: Forces and Interactions ☐ Objects at rest ☐ Objects moving with constant velocity ☐ Accelerating objects Forces HS-PS2 Motion and Stability: Forces and Interactions Force is a vector quantity, having both magnitude and direction. The opportunity to measure force in the lab must be provided ☐ Force diagrams ☐ Types of forces (gravity, friction, normal, tension ☐Field model for forces at a distance	• ODE Model Curriculum • Chapters 11 and 12 • Unit 3 Curriculum Maps • www.physicsclassroom.com/mmedia/.../trip.cfm • www.ck12.org/physics/ • “Forces in 1 Dimension” interactive simulation allowing students to explore forces at work when trying to push a filing cabinet. • “Motion Diagrams” is a tutorial from Western Kentucky University that shows how to draw various motion diagrams • atlantis.coe.uh.edu/texasipc/units/motion/munit.pdf • * Insulators and Conductors - TryEngineering • tryengineering.org/lessons/insandcond.pdf • SOLE Cleveland
Spiraling	ELA: W.9-10.1, W.9-10.7,; L.9-10.6 MATH: HSN-Q.A.1, HSA-CED.A.4 Expressions & Equations: 8.A.4	
Essential Questions	• UbD : Forces and Motion – Measuring Motion and ... - Ba	
Differentiated Instruction	• https://sites.google.com/a/staff.lisd.net/...8th-grade...ap-science/unit-1---forces-motion	
Assessments	• Pro-Core Leader in Focused Diagnostics Standards-Based	
Vocabulary	• www.quia.com/jg/1458821list.html	

FOURTH QUARTER: The Universe		Resources
<i>In early elementary school, observations of the sky and space are the foundation for developing a deeper knowledge of the solar system. In late elementary school, the parts of the solar system are introduced, including characteristics of the sun and planets, orbits and celestial bodies. At the middle school level, energy, waves, gravity and density are emphasized in the physical sciences, and characteristics and patterns within the solar system are found. In the physical science course, the universe and galaxies are introduced, building upon the previous knowledge about space and the solar system in the earlier grades.</i>		
UNIT 4 LENGTH: Days/Weeks 40		
UNIT 4 STANDARDS		
	History of the Universe HS-ESS1 Next Generation Standards The Big Bang Model is a broadly accepted theory for the origin and evolution of our universe. It postulates that 12 to 14 billion years ago, the portion of the universe seen today was only a few millimeters across. Galaxy Formation HS-ESS1-2. Next Generation Standards A galaxy is a group of billions of individual stars, star systems, star clusters, dust and gas bound together by gravity. There are billions of galaxies in the universe, and they are classified by size and shape. The Milky Way is a spiral galaxy. It has more than 100 billion stars and a diameter of more than 100,000 light years. At the center of the Milky Way is a collection of stars bulging outward from the disk, from which extend spiral arms of gas, dust and most of the young stars. The solar system is part of the Milky Way galaxy. □ Hubble's law states that galaxies that are farther away have a greater red shift, so the speed at which a galaxy is moving away is proportional to its distance from the Earth. Red shift is a phenomenon due to Doppler shifting, so the shift of light from a galaxy to the red end of the spectrum indicates that the galaxy and the observer are moving farther away from one another. Doppler shifting also is found in the Energy and Waves section of this course. Stars HS-ESS1-3 Next Generation Standards Early in the formation of the universe, stars coalesced out of clouds of hydrogen and helium and clumped together by gravitational attraction into galaxies. When heated to a sufficiently high temperature by gravitational attraction, stars begin nuclear reactions, which convert matter to energy and fuse the lighter elements into heavier ones. These and other fusion processes in stars have led to the formation of all the other elements. (NAEP 2009). All of the elements, except for hydrogen and helium, originated from the nuclear fusion reactions of stars (College Board Standards for College Success, 2009). HS-ESS1 Earth's Place IN THE UNIVERSE. Next Generation Standards □ Formation, stages of evolution: Stars are classified by their color, size, luminosity and mass. A Hertzsprung-Russell diagram must be used to estimate the sizes of stars and predict how stars will evolve. Most stars fall on the main sequence of the H-R diagram, a diagonal band running from the bright hot stars on the upper left to the dim cool stars on the lower right. □ Fusion in stars: A star's mass determines the star's place on the main sequence and how long it will stay there. Patterns of stellar evolution are based on the mass of the star. Stars begin to collapse as the core energy dissipates. Nuclear reactions outside the core cause expansion of the star, eventually leading to the collapse of the star. Note: Names of stars and naming the evolutionary stage of a star from memory will not be assessed. The emphasis is on the interpretation of data (using diagrams and charts) and the criteria and processes needed to make those determinations.	• ODE Model Curriculum • Unit 4 Curriculum Map • www.nasa.gov/ • www.discoveryeducation.com/9-12/science • Activity: Stellar Evolution Scavenger Hunt can be found at chandra.harvard.edu/.../activities/stellar_evol • Carl Sagan's Cosmos: videos that demonstrate how the constantly changing universe affects planets, spacecraft that venture out into deep space, and a number of other natural phenomena can be found at www.hulu.com/cosmos • SOLE Cleveland
Spiraling	ELA: W.9-10.1, W.9-10.7, L.9-10.6, RST.9-10.7, RST.9-10.8 MATH: HSN-Q.A.1, HSA-CED.A.4 .10.6 Expressions & Equations :8.A.4	
Essential Questions	• Essential Questions High School Science Essential Curriculum - Earth and Spa	
Differentiated Instruction	• Edwin Hubble & the Expanding Universe • Galaxies and the Universe • Differentiation "A Big History of the Universe for Secondary Education" • The Evolution of the Early Universe - Video & Lesson Transcr	
Assessments	• Pro-Core Leader in Focused Diagnostics Standards-Based	
Vocabulary	• Vocabulary physical science vocabulary - Lancaster Central School Di	